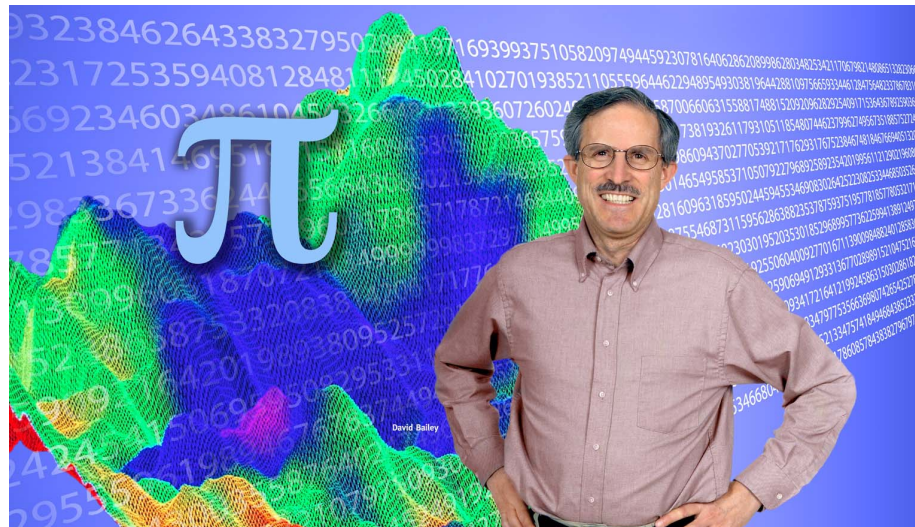


Creationism and Intelligent Design: False Friends

David H Bailey, Lawrence Berkeley National Lab, USA

<http://crd.lbl.gov/~dhbailey>

<http://www.sciencemeetsreligion.org>



Scientists and scholars are losing the battle for the hearts and minds of the public



- ◆ 2007 poll:
 - 44% believe that evolution, particularly as it relates to human beings, is “probably” or “definitely” false.
- ◆ 2009 poll:
 - 39% agreed that “God created the universe, the earth, the sun, moon, stars, plants, animals and the first two people within the past 10,000 years.”
 - 35% agreed that “The theory of evolution is not supported by any confirmed facts.”
 - 43% agreed that “Human fossils have been found mixed in with dinosaur fossils showing that humans existed at the same time that dinosaurs existed.”
- ◆ 2010 poll:
 - 40% believe that “God created humans in their present form within the last 10,000 years.”

This severe disconnect between the public and the scientific world threatens:

- ◆ Progress in fields ranging from medicine and biotechnology to cosmology.
- ◆ Funding for a broad range of basic scientific research.

Statistics for the LDS community



Given that this meeting is in Salt Lake City, the following may be of interest:

In a recent survey of Brigham Young University students (98% of whom are LDS), among students starting Biology 100 (freshman biology for non-majors):

- ◆ 48% agreed that while “Evolution might apply to some limited circumstances, it does not occur across boundaries which separate major categories of plants and animals; it may apply to lower forms but not to man.”
- ◆ 21% agreed that the earth is only a few thousand years old.
- ◆ 50% agreed that creationism and evolution should be given equal time in public schools.
- ◆ For Zoology 101 (freshman zoology majors), the figures were similar: 55%, 28% and 57%.
- ◆ On the other hand, for Zoology 475 (upper-division zoology majors), the figures were much lower: 23%, 7% and 29%.

While many well-educated LDS persons are quite accomplished in scientific fields, significant fundamentalism remains among the rank and file.

Science in LDS theology



- ◆ Some LDS theologians have readily accommodated modern science:
 - Geologists say that these very simple forms of plant and animal bodies were succeeded by others more complicated; and in the indestructible record of the rocks they read the story of advancing life from the simple to the more complex, from the single-celled protozoan to the highest animals, from the marine algae to the advanced types of flowering plant – to the apple-tree, the rose, and the oak. What a fascinating story is inscribed upon the stony pages of the earth's crust! ... The opening chapters of Genesis, and scriptures related thereto, were never intended as a textbook of geology, archaeology, earth-science or man-science. [James E. Talmage (LDS Apostle), 1931]
 - On the other hand, to limit and insist upon the whole of life and death to this side of Adam's advent to the earth, some six or eight thousand years ago, as proposed by some, is to fly in the face of the facts so indisputably brought to light by the researcher of science in modern times. ... To pay attention to and give reasonable credence to their research and findings is to link the church of God with the highest increase of human thought and effort. [B. H. Roberts (LDS Seventy), 1931]
- ◆ But others have been more negative on science, particularly evolution:
 - I say most emphatically, you cannot believe in this theory of the origin of man, and at the same time accept the plan of salvation as set forth by the Lord our God. You must choose the one and reject the other. [Joseph Fielding Smith (LDS Apostle), 1952]
 - There is no harmony between the truths of revealed religion and the theories of organic evolution. [Bruce R. McConkie (LDS Apostle), 1966]

Creationism and intelligent design



For the purposes of this study, creationism and intelligent design are defined as follows:

- ♦ Creationism: The modern-day movement that holds that the creation of the earth (or the universe as a whole) occurred by explicit acts of a supernatural Being over a very short time period (typically 6 days or 6000 years), completing about 6000 years ago. This is often termed “young-earth creationism.”
- ♦ Intelligent design: The modern-day movement that holds while the creation may have occurred over a very long time period, nonetheless the emergence of individual “kinds” could not have proceeded by natural evolution, but instead must have been the product of design.

Note that these terms refers to the specific movements mentioned; they do not apply to the more general belief that some supernatural being governed or enacted, in some sense, the process that resulted in our world.

The consensus of the scientific community is that key precepts of these movements (particularly young-earth creationism) are mistaken.

Dos and Don'ts in dealing with creationism and intelligent design



Dos:

- ◆ For those who are concerned that science is opposed to religion, refer them to works by prominent scientists who are openly religious:
 - Kenneth Miller (Catholic), Francisco Ayala (Catholic), Francis Collins (evangelical), John Polkinghorne (Anglican), James E. Talmage (LDS), Henry Eyring (LDS), etc.
- ◆ If a specific issue is raised, briefly point out that scientists have already debated the issue at length in scientific journals, and have reached a solid consensus (many years ago, in the case of old-earth geology and basic evolutionary theory).
- ◆ For those who sincerely want more details, provide links to high-quality, well-documented online material that addresses the specific questions in a technically sound but respectful manner.
- ◆ Briefly explain some of the fallacies of creationism and intelligent design (ID).

Don'ts:

- ◆ Don't denigrate religious beliefs – there is no need to.
- ◆ Don't refer people to highly technical material (most original articles and books) – these probably won't get read, much less understood.
- ◆ Don't get mired in “debates” – instead, point out that peer-reviewed scientific journals are the only appropriate forum to discuss genuine scientific issues.

My own humble attempt at peacemaking



<http://www.sciencemeetsreligion.org>

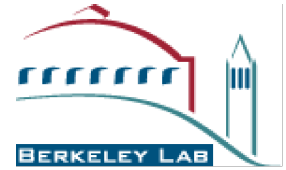
Devoted to demonstrating:

- ◆ There is no need for a “war” between science and religion.
- ◆ Creationism and intelligent design are deeply flawed, both scientifically and philosophically.

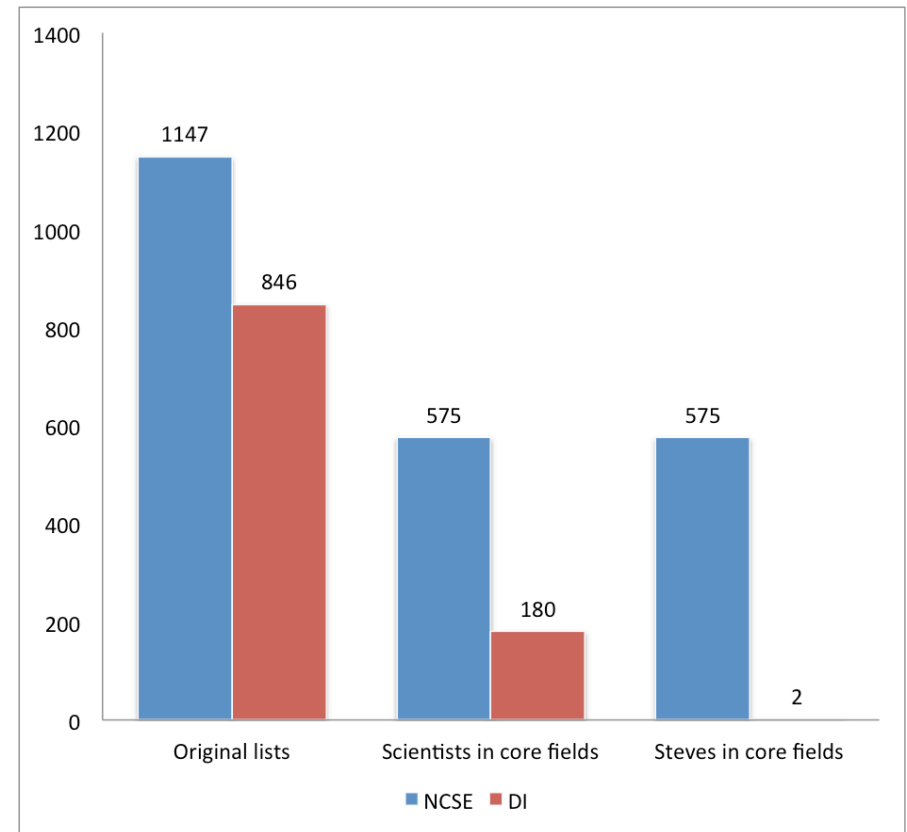
Features:

- ◆ A news chronicle – updated every two or three days.
- ◆ A blog – updated every two or three weeks.
- ◆ 21 articles on evolution: creationism, intelligent design, geologic dating, evolutionary novelty, probability and evolution, origin of life, etc.
- ◆ 8 articles on physics and cosmology: big bang, multiverse, Fermi’s paradox, etc.
- ◆ 24 articles on theology and philosophy: biblical scholarship, atheism, naturalism, postmodernism, theological problems with creationism, etc.
- ◆ Targeted to a general audience.
- ◆ No advertisements or promotions (scientific, religious or commercial).
- ◆ Currently 500 hits per day (on average).

Creationist/ID claim #1: “Many scientists question evolution”



- ◆ In 2001 the Discovery Institute formed a list of scientists who “dissent” from Darwinism. It currently has 846 names.
- ◆ In 2008, the National Center for Science Education formed a list of persons named “Steven” or “Stephen” (~1% of population) who accept the basic principles of evolution. It currently has 1147 names.
- ◆ If we restrict the two lists to those with a Ph.D. and/or professorial position in a core field closely related to evolution, the two lists have 575 and 180 names, respectively.
- ◆ Only two persons on the restricted DI list are named “Steven” or “Stephen,” compared with 575 in the NCSE list.



In short, well-qualified scientists who accept the basic tenets of evolution outnumber those who question evolution by at least a factor of 100 to one, perhaps 300 to one.

Ref: <http://www.sciencemeetsreligion.org/evolution/scientists-evolution.php>

Creationist/ID claim #2: “There is a conspiracy among scientists”



The recent ID-produced movie “Expelled” suggested a conspiracy among scientists to suppress evidence against evolution.

- ◆ How can a “conspiracy” be maintained in a worldwide scientific community representing every nation, society and religious movement on earth?
- ◆ Thousands of senior-level scientists are among the many who are facing foreclosure or a drastic drop in retirement savings due to the recent financial crisis. Why haven’t any of them stepped forward to expose the conspiracy, and thus become wealthy through book contracts and speaker fees?

Relevant quotes:

- ◆ “Three can keep a secret, provided two of them are dead.” [Ben Franklin]
- ◆ “Even as these [theories] are overwhelmingly accepted by the scientific community, fame still awaits anyone who could show these theories to be wrong.” [numerous prominent scientists in letter to *Science*, 2010]
- ◆ “You have no idea how humiliating this is to me – there is a secret conspiracy among leading scientists, but no one deemed me important enough to be included!” [DHB, tongue-in-cheek email to a Utah legislator, 2005]

Ref: <http://www.sciencemeetsreligion.org/theology/conspiracy.php>

Recent examples of public scientific spats



Frequent (and often heated) debates are common between competing camps of research scientists. How can any “conspiracy” be maintained in this environment?

- ◆ The “Hobbit” fossils on Flores Island, Indonesia (2004):
 - Fossils are merely microcephalic humans. [Hennenberg et al, 2005]
 - Henneberg article is “an extremely poorly informed, and ill designed, piece of ‘research’.” [Brown, 2005]
- ◆ Ardi fossil (2009):
 - Ardi split off before main line leading to Homo sapiens. [Harrison, 2011]
 - Harrison’s article is a “six page illustrated op-ed piece.” [White, 2011]
- ◆ Arsenic-eating bacteria at Mono Lake, CA (2010):
 - “If this data was presented by a PhD student at their committee meeting, I’d send them back to the bench to do more cleanup and controls.” [Redfield, 2011]
- ◆ Hamilton’s theory on kin selection:
 - Not necessary to invoke Hamilton’s theory. [Wilson et al, 2010]
 - Wilson et al paper is wrong. [150 scientists in letter to *Nature*, 2011]
- ◆ String theory:
 - “A scientific theory that makes no predictions and therefore is not subject to experiment can never fail, but such a theory can never succeed either, as long as science stands for knowledge gained from rational argument borne out by evidence.” [Smolin, 2006]

Creationist/ID claim #3: “There are gaps in the fossil record”



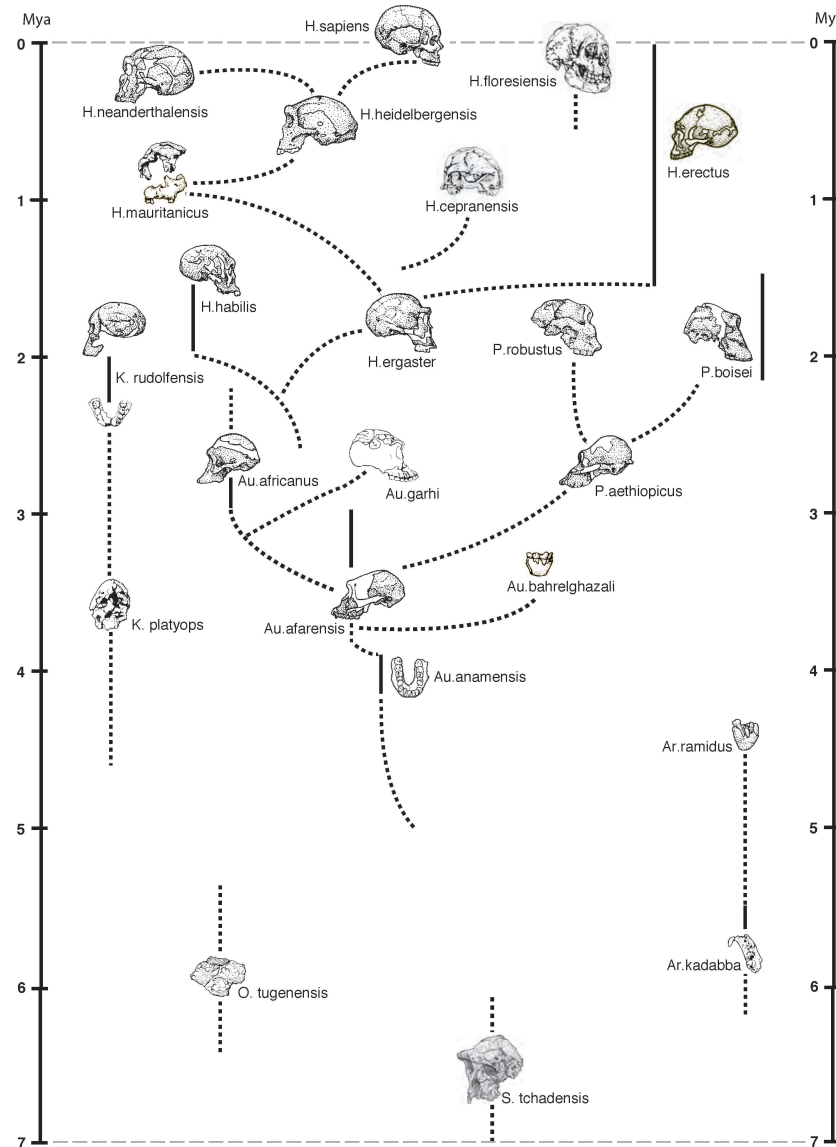
Creationists and ID writers often cite the fact that there are gaps in the fossil record as evidence that evolution is fundamentally flawed. In fact, many of these “gaps” have already been filled:

- ◆ Multicellular life has been found far earlier than the Cambrian explosion (600 Myr). Researchers in Gabon recently found 250 fossils dated to 2.1 Byr ago.
- ◆ 30 intermediates are now known between land mammals and marine mammals, with exactly the expected combination of terrestrial and aquatic features.
- ◆ Researchers recently found the long-sought transition between bony fish and four-legged animals – a fossil named “Tiktaalik” in the Canadian Arctic Ocean.
- ◆ 22 distinct species of elephants have been identified during the past 6 Myr.
- ◆ Numerous fossils have been found confirming that birds are descendants of dinosaurs.
- ◆ At least 20 distinct prehuman species have now been identified. We might not yet know which are direct ancestors, but there is certainly no shortage of candidates.

Ref: <http://www.sciencemeetsreligion.org/evolution/fossils.php>

<http://www.sciencemeetsreligion.org/evolution/prehuman-fossils.php>

Known prehuman species



Graphic credit: Ian Tattersall, in Prothero, *What the Fossils Say and Why It Matters*, 2007

Creationist/ID claim #4: “Probability arguments refute evolution”



Creationist and ID writers often cite arguments against evolution based on probability calculations. Example:

- ◆ The human alpha-globin molecule is 141 amino acids long, so there are $141^{20} = 10^{183}$ (approx.) possibilities. This figure is so huge that even after billions of years of random trials, no alpha-globin molecule would ever form.

Fallacies:

- ◆ This argument ignores the fact that a large range of molecules could perform the essential oxygen transfer function – in fact only 25 of the 141 locations need be fixed. This reduces the number to “only” 10^{33} , a huge but manageable number.
- ◆ In any event, all such calculations suffer from the fatal fallacy of presuming that a structure such as alpha-globin arises by a single all-at-once random event. Instead, available evidence suggests that alpha-globin arose as the end product of a long sequence of intermediate steps, each of which was biologically useful in an earlier context.

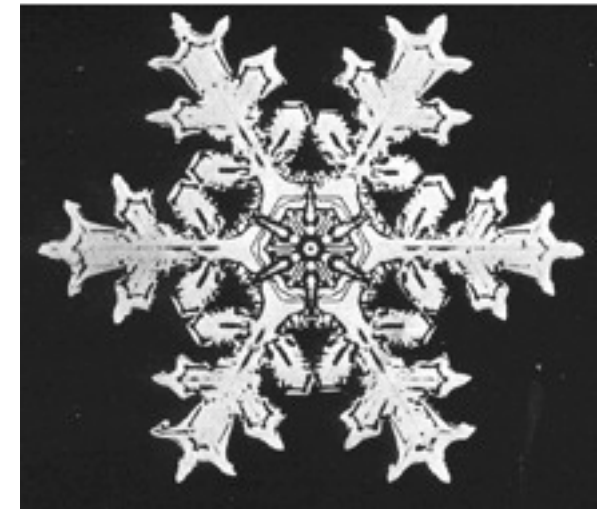
Probability calculations that ignore the step-by-step process by which a biological structure was formed are highly misleading and prove nothing.

Ref: <http://www.sciencemeetsreligion.org/evolution/probability.php>

Are snowflakes individually created?

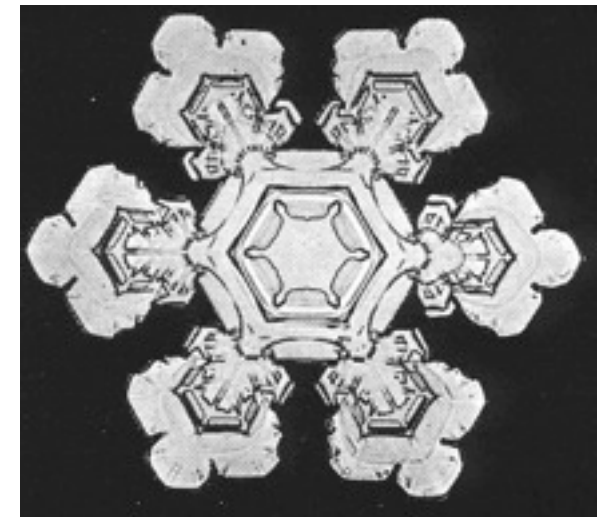
Probability arguments used to claim that various biomolecules cannot be created without supernatural intervention can be employed to argue that snowflakes cannot be created without supernatural intervention:

- ◆ Most snowflakes exhibit a highly regular structure – typically 6-way symmetric.
- ◆ The probability that such a structure could arise as a “random” assemblage of water molecules is fantastically remote – roughly one in 10^{2500} .



Fallacy:

- ◆ Once again, the principal fallacy is to assume that snowflakes arise as an all-at-once random event. Instead they arise in a long series of steps, each governed by natural processes.



Creationist/ID claim #5: “The world may look old, but that is only because God created it to appear that way”



Creationist Henry Morris, among others, acknowledges the evidence for a very old earth and universe, but explains that God created the world with an “appearance of age:”

- “This creation must have included all the chemical elements already organized in all the organic and inorganic chemical compounds and mixtures necessary to support the processes of the earth and of life on the earth. These processes include the phenomena of radioactivity.” [Whitcomb and Morris, 2000]
- “[T]he light rays ... must have been created carrying information descriptive of historical physical events (such as super novae) which never actually occurred, because we would now be observing light rays which were created in transit and never were radiated from the stars which they seem to image.” [Boardman, Koontz and Morris, 1973]

Implications for geology and astronomy:

- ◆ Each of the 10^{30} specks of rock 0.1 mm in size (which can now be reliably dated) within 2 km of earth’s surface must have been individually constructed 6000 years ago with numerous long-lived radioactive isotopes that are typical of multi-million-year-old material.
- ◆ Each second, each of the 10^{50} photons of light from distant galaxies (which are millions of light-years away) reaching the Milky Way must have been individually constructed 6000 years ago, in transit with red-shifts and other features of very distant objects. Thus a total of roughly 10^{60} phony photons have been constructed.

Ref: <http://www.sciencemeetsreligion.org/theology/deceiver.php>

Commentary on “God the Great Deceiver” theology



- ◆ “In order to defend God against the challenge they see from evolution, [creationists] have to make him into a schemer, a trickster, even a charlatan. ... To embrace that God, we must reject science and worship deception itself.” [Kenneth Miller, 1999]
- ◆ The image of God as a cosmic trickster seems to be the ultimate admission of defeat for the Creationist perspective. Would God as the great deceiver be an entity one would want to worship? Is this consistent with everything else we know about God from the Bible, from the Moral Law, and from every other source – namely, that he is loving, logical and consistent? [Francis Collins, 2006]

Creationist/ID claim #6: “The human body is perfectly designed”



Meticulous “design” is drawn into question by the numerous deficient features of the human body (and other biological organisms). At best, design must be seen in a high-level sense, not in low-level mechanics.

- ◆ Scurvy (scourge of British seamen and of Mormon pioneers) results when humans don’t get enough Vitamin C. Almost all mammals generate their own vitamin C, but while humans have the same machinery, it doesn’t work because mutations have inactivated a key step. This error has been copied into several primates.
- ◆ In eyes of humans (and other mammals), the optic nerves emerge from the front of the retina, and then travel to the back, resulting in a blind spot. Mollusk eyes are designed more logically with nerve connections on the back of the retina.
- ◆ The laryngeal nerve takes a detour down into the chest, around one of the main arteries near the heart, and then back up the neck to the larynx.
- ◆ Humans are subject to over 500 genetic disorders, e.g.:
 - Cystic fibrosis involves mutations in a handful of nucleotides.
 - Huntington’s disease has been narrowed down to errors at a specific spot on chromosome four.
- ◆ Nearly all species that have ever arisen on this planet have become extinct. It seems strange to suggest that God designed each of them to fall into oblivion.

Ref: <http://www.sciencemeetsreligion.org/evolution/design.php>

Creationist/ID claim #7: “Evolution can’t produce anything new”



Creationist and ID writers often claim that “undirected evolution” cannot produce anything new. Yet numerous studies have demonstrated true evolutionary novelty:

- ◆ In 1974, Hall and Hartl identified a gene in *E. Coli* that codes for lactose metabolism, then removed it. Within 24 hours of evolution, the bacteria had re-evolved a similar but distinct system.
- ◆ In 1994, Lenski and colleagues completed a 20-year experiment with multiple flasks of labeled *E. Coli* cultures. After 20,000 generations, two lines “discovered” a pathway to metabolize glucose. After 33,000 generations, one line “discovered” a pathway to metabolize citrate (which *E. Coli* normally cannot use), by means of a remarkable combination of two distinct mutations.
- ◆ In 1994, Japanese biologists discovered that a bacterial species had undergone a “frame shift” mutation that enabled it to thrive on nylon waste.
- ◆ In 2002, scientists at the Berkeley Lab found that certain Italian persons descended from a single individual several generations back possess a genetic mutation that increases “good” cholesterol, leading to significantly improved cardiovascular health.
- ◆ In 2010, researchers found that Tibetan highlanders have evolved ten unique genes that permit them to thrive at very high altitudes.

Ref: <http://www.sciencemeetsreligion.org/evolution/novelty.php>

DHB's study: Can an evolutionary process generate English text?



I utilized methods of high-performance computing (my field) and evolutionary programming to explore whether an evolutionary process could generate English text:

- ◆ My program first constructs a set of 1024 segments of text, each 64 characters long, with each character chosen at random according to natural frequencies. E.g.:
 - ao ,fludoy aocueu feidh,iaemehaiheyh daneny shpesaems y nhte
 - nrtnnbaa.nn hymeo t fiilunnw nt t,ntehg eu y' t h l dieosea ii
 - mbdsoee lueleciro ,ynaeenetg itln h srw l,pn uf sveen,ee a'l sl
 - snd etke snoymnra lhs gdnunmrs e trlhueafpraa.c.ys f yjser g
- ◆ Each segment is then scored according to how well 16-long strings match 16-long strings in Charles Dickens' *Great Expectations*.
- ◆ 10,000 evolution-like iterations are then performed:
 - Top-scoring segments "mate" (exchange 4-long strings) with other segments.
 - Several different types of random mutations are performed.
 - Resulting strings are re-scored and re-sorted.
- ◆ After completion, the top-scoring segment is selected; others are discarded.
- ◆ 24,576 repetitions of the above process were performed, resulting in 24,576 strings of length 64.
- ◆ Computations were done on a highly parallel supercomputer at the Berkeley Lab.

Can you tell which are computer-generated and which are authentic Dickens?



1. up at it for an instant. but he was down on the rank wet grass,
2. or do any such job, i was favoured with the employment. in order,
3. at the fire as she took up her work again, and said she would be
4. the monster was even careless as to the word that i had him so.
5. as to go with him to his father's house on a visit, that i might
6. fitted it to nothing and get the ashes between me to the last.
7. as no relation into another that it is the same room - a little
8. a separation to be made for the desolater, like the man he was.
9. we said that as you put it in your pocket very glad to get it, you
10. that he had treated him to a little bee, he was to call the
11. if he had for a time such an interest here and contented me.
12. great iron coat-tails, as he had done, and then ran to that.
13. he saw me going to ask him anything, he looked at me with his glass
14. on my objecting to this retreat, he took us into another room with
15. been born on there, or that i had the greatest indignature.
16. the chimney as though it could not bear to go out into such a night
17. later to settle to anything i had hesitated as to the sound.
18. the greatest slight and injury that could be done to the many far
19. of it on the hearth close to the fear that she had done rather
20. out of my thoughts for a few moments together since the hiding had

English text study results



- ◆ The 20 segments were presented to 66 students at a large western U.S. university who had affirmed that they were reasonably knowledgeable in Dickens literature.
- ◆ Majority vote (among the 66 responses) was correct for most of the 20 items, but was wrong for five items and marginal in two others.
- ◆ All computer-generated items had at least 18 incorrect responses (out of 66).
- ◆ One computer-generated item (#8) had only 17 correct responses (out of 66).

Other items of note:

- ◆ The program generated many valid words not found in *Great Expectations*, e.g.:
administer, agitate, attraction, conspire, contentions, credited, deceived, discriminate, distances, enhance, formations, generation, inconvenient, intentionally, liberated, mission, possibilities, powered, releases, searches, spheres, termination, weathers
- ◆ The total length of computer-generated output exceeded the total length of *Great Expectations*, even after applying a text-compression utility to each.

Answers to quiz:

- ◆ Authentic Dickens: 1, 2, 3, 5, 9, 13, 14, 16, 18, 20
- ◆ Computer generated: 4, 6, 7, 8, 10, 11, 12, 15, 17, 19

Ref: David H. Bailey, "Can an evolutionary process generate English text?," *Biological Theory*, vol. 4, no. 2 (Spring 2009), pg. 125-131, available at <http://crd.lbl.gov/~dhbailey/dhbpapers/dhb-english-text.pdf>.

Conclusion



- ♦ Scientists and scholars are losing the war for the hearts and minds of the public, and must find more effective ways to engage the public.
- ♦ Creationism and ID are “false friends” to those of religious faith – these theories are deeply flawed, both scientifically and philosophically.
- ♦ My study shows that an evolutionary process can generate passable Dickens-like text – one of many studies countering the claim that evolutionary processes can’t create anything new.

Why all the fighting?

- ♦ Both scientists and nonscientists can stand in awe at the majesty of the universe, which is now known to be much vaster, more intricate and more magnificent than ever before realized in human history.
 - On the other hand, I maintain that the cosmic religious feeling is the strongest and noblest motive for scientific research. [Albert Einstein, 1930]
 - “How is it that hardly any major religion has looked at science and concluded, “This is better than we thought! The Universe is much bigger than our prophets said, grander, more subtle, more elegant?” Instead they say, “No, no, no! My god is a little god, and I want him to stay that way.” A religion old or new, that stressed the magnificence of the universe as revealed by modern science, might be able to draw forth reserves of reverence and awe hardly tapped by the conventional faiths. Sooner or later, such a religion will emerge. [Carl Sagan, 1994]